TM-786/000/00



# TECHNICAL MEMORANDUM

(TM Series)

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## Modification to COPII for 12XX



By
Billie Rhae Pruett
J. B. Mahon

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SYSTEM DEVELOPMENT CORPORATION
2500 COLORADO AVE.
SANTA MONICA
CALIFORNIA

At the present time Lockheed Missiles and Space Corporation (LMSC) has the integration responsibility for the 12XX series. These flights are currently being operated under the 12XX COP System which was designed, developed and is maintained by LMSC.

When SDC becomes responsible for the 12XX series, it will be converted to the COPII System. There are features in the 12XX COP System which must be incorporated into COPII to facilitate a smooth changeover. These features were discussed with LMSC on 30 August 1962, and are outlined in this document.

The major features in the 12XX COP that must be integrated into the COPII System include the alpha-numeric (A/N) display capability, additional Reference Symbol Table items and new pseudos in the assembly program.

MTCII Changes

The changes to MTCII to implement the features of 1205 include adding symbols to the Reference Symbol Table in LARII and providing the alpha-numeric capability.

1. Alpha-numeric capability

   The alpha-numeric display capability requires numerous changes to the COPII control program. Normally, the alpha-numeric display (LAN) routine is entered via an interrupt. There are times when an interrupt is not feasible (e.g., during the loading cycle of MTCII); therefore, an interrupt lock-out feature must be incorporated into the system.

   The changes required to incorporate the alpha-numeric feature are:

   a. Modification to the Bootstrap routine to deselect interrupt.

   b. Modification to the control and loading cycles to select or deselect interrupt lock-out, whichever is desired.

   c. An expansion of the interrupt routine to check for alpha-numeric interrupt and to take the appropriate action in case of such an interrupt.

   d. Inclusion of LOCK and UNLOCK routines whose purpose is to either disable or enable interrupts.

   e. Inclusion of the STOP routine which will be used by all programs when a STOP is desired.

2. MTCII Symbols

The following symbols must be added to the RST table:

| | |
|---|---|
| AUTOTEST | .READ |
| MOD | WRITE |
| PAR | CLANK |
| UNLOCK | STOP |
| LOCK | CROSREF |
| LDIR | |

3. Components of MTCII

LOCK - is a routine which disables interrupt.

UNLOCK - is a routine which enables interrupt.

STOP - is designed to keep the computer running to allow servicing A/N requests. Programs which normally halt after error indications or instructions should utilize the STOP feature. To utilize the STOP feature, a program must replace all

```
        SLS     LOCATION
```

with

```
    +   RTJ     STOP
        NØP     LOCATION
```

The STOP routine will type-out:

```
        SLS     LOCATION
```

and will then cycle reading the typewriter. The operator can type either

```
    X   GO      carriage return
```

or

```
        GO      carriage return
```

where X is a parameter with the same format as allowed on function cards. After the carriage return, a transfer will be made to LOCATION. If a parameter is typed before GO, it will be converted and stored in the A register. If a mistake is made

while typing the parameter X, type a "carriage return" before GO is typed completely. The STOP routine will start again, typing

SLS LOCATION

During the reading and processing of function cards and the loading of routines from the Master Tape, all interrupts are disabled. However, if MTCII is cycling awaiting its next request, interrupts are enabled.

LARII Changes

It will be necessary to add three pseudo instructions to LARII.

1. XCA - Exchange the A and Q registers.
2. SZL - Store zero in lower address of the cell specified.
3. SZU - Store zero in the upper address of the cell specified.

Changes to 12XX Elements

12XX programs that refer to tables and items in the control program must either be assembled under the COPII System or modified if they reference tables whose formats or names have changed, or tables that have been deleted. The formats of the tables and buffers are described in TM-745/000/00, Master Tape Control II.

The tables in MTCII that have changed are:

TABLE/ØF
Directory (blocks 2 and 3)
EQUIVS

The tables and items that have been deleted are:

LIST/ØF
CODES
NEEDY

The items whose names differ are:

| 12XX | COPII |
|---|---|
| CALL | CALROUT |
| MORE | CALL |

The calling sequence generated by MTCII is not located at 00213B. However, the address of the calling sequence can be obtained from the upper address of the word at location 00213.

## Conclusion

According to the best information available, the changes to COPII, as described in this document, should be sufficient to allow its usage in place of the LMSC 12XX version of COP. If there are additional changes required, these additions should be made available to us as soon as possible.

## References

1. Symbolic listing of the 1204 COP control program.

2. Coordination meeting with LMSC, 30 August 1962.

3. LMSC paper, CHANGES TO COP FOR VEHICLE 1204, H. F. Grover.

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Reports that at present Lockheed Missiles and Space Corporation (LMSC) has the integration responsibility for the 12XX flight series. States that when System Development Corporation becomes responsible for the 12XX series, it will be converted to the COPII (Control for Operational Programs) System. Outlines features in the 12XX COP that must be integrated into the COPII System.

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